

REMARKS

Summary of Amendments

1. Claims 1-9 were originally presented in this application. Claims 10-16 were added in a preliminary amendment dated December 30, 2004. Claims 3 and 10 have been canceled, without prejudice, in this paper. Claims 1 and 2 have been amended, as described in more detail below, to more particularly point out and distinctly claim the subject matter of the instant invention. Claims 1, 2, 4-9, and 11-16 thus remain pending.

Rejections – 35 U.S.C. § 102

2. Claims 1, 3, 4, 5, 6, and 8 stand rejected under 35 U.S.C. § 102(b) as being anticipated by *Usui et al.* (U.S. Pat. Pub. No. 2002/0197825). In particular, regarding claim 1, the Examiner states:

Usui et al. discloses a method of manufacturing a group III-V crystal . . . comprising: a step of depositing a metal film 3 on a substrate [0133]; a step of heat-treating the metal film under an atmosphere in which a patterning compound is present [0133], the pattern compound [being] present (hydrogen and ammonium) so that the metal film becomes patterned with a plurality of holes or grooves having an indefinite shape ([0034]; Fig. 12c); [and] a step of growing III-V compound crystal 4 on the metal film (Fig. 12d). Note that the shape of the voids formed in metal film due to the heat-treating in *Usui et al.* [is] considered as indefinite because the shape of the voids in *Usui et al.* is uncontrolled. The shape of the voids is formed from heat treatment without any pattern or mask. Therefore, voids and metal film can be formed [in] any shape.

3. Applicants respectfully traverse this rejection to the extent that it is pertinent to independent claim 1 as amended herein. Claim 1 has been amended to recite:

a heat-treatment step of heat-treating the metal film under an atmosphere in which a metal-film patterning compound is present so that the metal film becomes patterned with a plurality of grooves having an indefinite shape, the grooves having an average width of 2 nm to 5000 nm, the metal film having an aperture fraction of 5% to 80%, the aperture fraction being the percentage of the surface area that the grooves occupy with respect to the substrate total surface area.

Amended claim 1 is fully supported by original claims 1 and 3, such that no new matter has been added and no new search should be required.

4. Applicants respectfully submit that independent claim 1 now distinguishes patentably over *Usui et al.* In particular, claim 1, as amended, recites a method in which the width of the grooves and the aperture fraction are controlled to yield crack-free GaN crystals. MPEP § 2131 states that a reference must teach every element of a claim in order to properly anticipate that claim. Applicant respectfully submits that *Usui et al.* does not teach the groove width or aperture fraction limitations now recited in claim 1 (and formerly recited in claim 3).
5. In making the § 102 rejection of original claim 3, the Examiner stated:

Usui et al. . . . further discloses the depth of the voids is up to 500 nm and the surface area [that] the holes or grooves (voids) in the metal occupy with respect to the substrate total surface area is about 65% which falls into the ranges disclosed in claim 3.

Claim 1 recites grooves having an average **width** of 2 nm to 5000 nm. This is in contrast to *Usui et al.* which discloses a **void depth** up to 500 nm. As illustrated in original Figs. 3A and 3B of the present specification, the width of the grooves in the present invention is determined when the substrate is viewed from above. In other words, the width of the grooves is measured **in the plane of the metal film**. Again, this is in contrast to the disclosure in *Usui et al.* of a void depth (which is a measure of the extent to which the voids penetrate the thickness of the film). *Usui et al.* measures a different property of the metal film (a void depth) and makes no disclosure or suggestion of an in-plane groove width. Accordingly, Applicants respectfully submit that the rejection under this section is improper for failing to comply with MPEP § 2131.

6. Claim 1 also recites that the metal film has an aperture fraction of 5% to 80%. The aperture fraction is defined on page 6 (equation 1) of the original specification as being:

$$(\text{holes or grooves occupying area})/(\text{substrate total surface area}) \times 100\%.$$

The aperture fraction, like the groove width, is determined when the substrate is viewed from above. In other words, the aperture fraction is an **in-plane measurement** of the percent groove area. This is in contrast to *Usui et al.* which states in paragraph [0134] that the void percentage is estimated from a cross sectional scanning electron micrograph of the film. *Usui et al.* measures a different property of the metal film and does not disclose, or suggest, an in-plane measurement of the void failing in this respect as well to comply with MPEP § 2131. Applicants therefore courteously urge that the rejection of independent claim 1 is overcome.

Rejections – 35 U.S.C. § 103

7. Claims 2 and 10-16 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Usui et al.* in view *Nagai* (EP 1378934). Applicants respectfully traverse this rejection to the extent that it is pertinent to amended claim 2. Claim 2 has been amended to include the same elements as describe above in Section 3 for claim 1. The amendment to claim 2 is fully supported by original claims 2 and 10, such that no new matter has been added and no new search should be required. Applicants further submit that claim 2 now distinguishes patentably over the prior art of record for the same reasons as described above in Sections 4 through 6 for claim 1. Applicants therefore courteously urge that the rejection of rejection of claim 2 is overcome.
8. Applicants believe that claims 1 and 2 are patentable over the prior art of record for the reasons set forth above. Independent claims 1 and 2 being allowable, it follows that dependent claims 4-9 and 11-16 must also be allowable.

Accordingly, Applicants courteously urge that this application is in condition for allowance. Reconsideration and withdrawal of the rejections is requested. Favorable action by the Examiner at an early date is solicited.

Respectfully submitted,

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